



First record of an *Apterichtus kendalli* (Gilbert, 1891) (Anguilliformes, Ophichthidae) leptocephalus in the Southeast Brazilian Bight: a southward occurrence record extension

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Abstract. The first record of *Apterichtus kendalli* in the Southeast Brazilian Bight is reported based on one leptocephalus collected at around the 100 m isobath during an oceanographic cruise in 1979. It is the southernmost record of this species in the Atlantic. The leptocephalus of *A. kendalli* was identified based on myomeres counts, fin positions, nine moderate gut swellings, and midline prominent patches of pigments.

Key words. Finless eel; fish larvae; leptocephali; range extension; Brazil; South Atlantic

There are 18 species of finless snake eels, genus *Apterichthys* Duméril, 1806, recorded worldwide, but little is known about their taxonomy and biology because they are hard to find since they are small, narrow benthic species that burrow in sand (McCOSKER & HIBINO 2015). Along the Brazilian coast, two species were recorded: *A. ansp* (Böhlke, 1968) from the south-east (McCOSKER et al. 1989) and *A. kendalli* (Gilbert, 1891) from the north and northeast (GBIF 2016).

Apterichtus kendalli has been assessed as Least Concern (LC) in the *IUCN Red List of Threatened Species*; its distribution may fall within a number of marine protected areas (McCOSKER 2010). It was previously recorded in the northwestern Atlantic, in the Carolinas, Florida, Bermuda, Bahamas, and Lesser Antilles (McCOSKER & HIBINO 2015) (Figure 1; Appendix Table A1). The distribution of *A. kendalli* in the Southeast Atlantic is based on isolated reports from St. Helena Island and north-northeast Brazil (McCOSKER & HIBINO 2015; GBIF 2016) (Figure 1; Appendix Table A1). The leptocephalus larvae of *A. kendalli* was described and illustrated by LEIBY (1982; 1989) based on specimens collected in the U.S. East Coast and Gulf of Mexico.

In the present study, we report the first record of an *A. kendalli* leptocephalus in the Southeast Brazilian Bight (SBB), which extends this species' distribution southward in the Atlantic.

One leptocephalus of *A. kendalli* was sorted from a plankton sample collected with an oblique tow using a bongo net with

333 µm mesh size (SMITH & RICHARDSON 1977) on 17 November 1978 as part of the FINEP 7 project (Funding of Studies and Projects) carried out in the SBB at 24°8.298' S, 044°43.398' W (Figure 1; Appendix Table A1). The ichthyoplankton sample was fixed in a buffered 4% formaldehyde-seawater solution.

Total length (TL) was measured and number of myomeres was counted. The specimen was deposited at the Biological Collection "Prof. Edmundo F. Nonato", Oceanographic Institute, São Paulo University (ColBIO/Catalog Number IP00622).

The sample containing the leptocephalus of *A. kendalli* was collected at 103 m isobath. Salinity in the sampling station was 36.3 at first 10 m depth and water temperature varied from 24.3 °C at the surface to 14.4 °C near to the bottom, which indicates Tropical Water at the surface and South Atlantic Central Water at the bottom.

The leptocephalus of *A. kendalli* (Figure 2) measured 67 mm TL and it was identified according to LEIBY (1982; 1989) and FAHAY (2007): dorsal fin confined to area near tail tip; nine moderate gut swellings; nephros ends on last gut loop, one myomere anterior to anus, at 71st myomere (71 nephric myomeres); last vertical blood vessel (LVBV) passing through 70–73rd myomeres; midline pigment includes prominent patches on every 3rd or 4th myoseptum; first patch at 9th myomere; four subcutaneous pigment patches on tail just below notochord; gut pigment includes patch on dorsal surface of each swelling; a saddle-shaped group of spots every 12 myomeres along ventral edge of tail; anal fin ray bases below these; some internal pigment on tip of notochord. Myomeres counts: 145 total, 72 preanal and 129 predorsal.

Other species of tribe Sphagebranchini recorded in Brazilian waters are *A. ansp*, *Ichthyapus ophineus* (Evermann & Marsh, 1900), and *Stictorhinus potamius* Böhlke & McCosker, 1975 (LEIBY 1989; McCOSKER et al. 1989; MENEZES et al. 2003). However, the leptocephalus of *A. kendalli* can be easily differentiated from those species based on number of myomeres (Leiby 1982, 1989; Fahay 2007) (Table 1).

The presence of an *A. kendalli* leptocephalus around 100 m

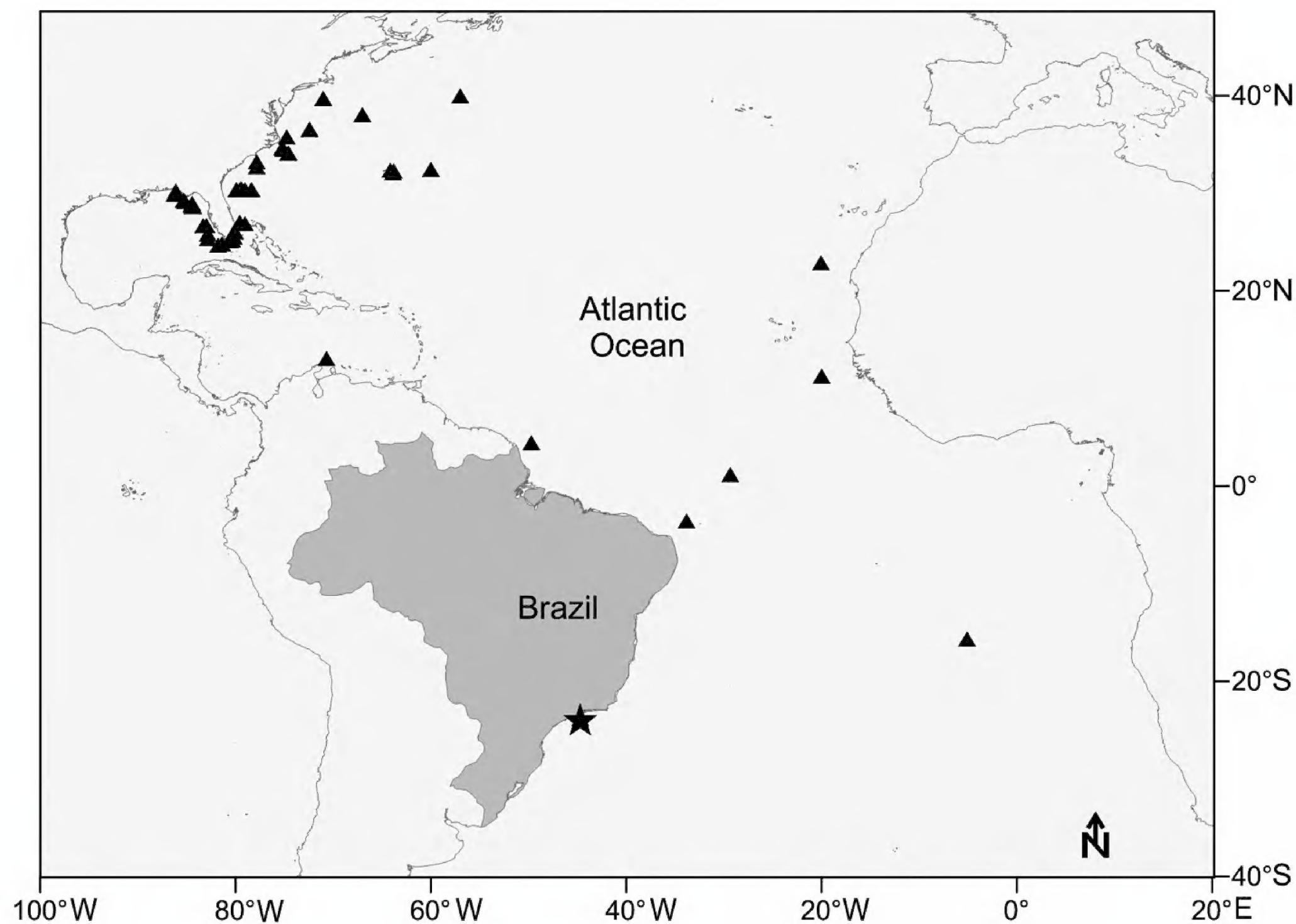


Figure 1. Distribution of *Apterichthus kendalli* in Atlantic Ocean. ▲ = previous records; ★ = new record (present study). Previous records data from GBIF (2016).

Table 1. Myomeres counts of Sphagenbranchini leptocephali (Leiby 1982, 1989) already recorded in Brazilian waters.

Species	Total myomeres	Nephric myomeres	Preal anal myomeres	Predorsal myomeres
<i>Apterichthus ansp</i>	129–136	63–67	65–70	114–125
<i>Apterichthus kendalli</i>	137–148	67–73	69–74	121–135
<i>Ichthyapus ophioneus</i>	130–139	49–53	50–54	117–130
<i>Stictorhinus potamius</i>	134–140	71–75	72–76	71–78

isobath is in accordance with species previous records in shallow areas along the U.S. East Coast, in the Gulf of Mexico (LEIBY 1982, 1989), and in the Florida current (Figure 2), where leptocephali can be transported further offshore by frontal jets (MILLER 1995).

In the 1990 and 2000s 14 new occurrences of Anguillifor-

mes (FIGUEIREDO et al. 2002; BERNARDES et al. 2005; COSTA et al. 2007; OLAVO et al. 2007; MELO et al. 2009), including larval stages (CASTRO & BONECKER 2005) and one new taxon (MELO 2007), were recorded in the Brazilian continental shelf and slope as part of the Brazilian Government project “Living Resources in the Exclusive Economic Zone” (REVIZEE).



Figure 2. Leptocephalus of *Apterichthus kendalli* 67 mm TL from the Southeast Brazilian Bight. Image made from multiple photos of the same specimen (ColBIO/Catalog Number IP00622). Photos by G. Monteiro.

However, no species of Sphagebranchini was reported in these cruises and *A. kendalli* was never recorded in the SBB in any stage of development. It is probably because *A. kendalli* is hard to find since it is a small (< 500 mm TL) and narrow benthic species that burrows in sand during its adulthood (McCOSKER et al. 1989). The only three records of *A. kendalli* in Brazilian waters are from north and northeast Brazil, in 1971 and 1981 respectively (GBIF 2016) (Figure 1; Appendix Table A1).

Leptocephali in general are rarely collected by standard plankton nets or any sized trawl during the day because they are much larger than typical fish larvae, have large eyes, mechanoreceptors, and can actively swim both forwards and backwards (MILLER 2009). Furthermore, it is extremely difficult to match larval forms to adult species using morphological features (MILLER 2009). Larval forms of anguilliforms were frequently described as new species and placed in the genus *Leptocephalus* until the 1960s. However, some of these species were revised and nowadays correctly identified (MELO & CAIRES accepted) with the publication in the last decades of descriptions of their early life stages (SMITH 1979; LEIBY 1982, 1989; FAHAY 2007). The historical records of preserved specimens in the biological collections are of inestimable value to the scientific knowledge (COTTERILL 1997). Comparing previous distributional data of species with current data can be useful in identifying changes caused by changes in sea surface temperature, ocean currents, and nutrient regime driven mainly by climate change and ocean warming (EDWARDS 2016).

New records are important contributions for understanding species diversity and biogeography, among other biological topics. In this study, a new record of *A. kendalli* helped improve knowledge of this species, extending its distribution further south of the Atlantic Ocean (Figure 2).

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APPENDIX

Table A1. Coordinates (latitude and longitude), date (month/year), and country of occurrence of *Apterichthus kendalli* (leptocephali and adult) used to plot the distribution map. Data from GBIF (2016). Current study data are shown in bold and signed with *.

Latitude, longitude	Date	Country	Latitude, longitude	Date	Country	Latitude, longitude	Date	Country
39°44' N, 056°59' W	4/1979		30°06' N, 079°03' W	2/1979	United States	25°34' N, 082°50' W	3/1889	United States
39°28' N, 071°02' W	5/1982	United States	30°06' N, 078°21' W	2/1979	United States	25°13' N, 080°10' W	7/1957	United States
37°46' N, 067°00' W	9/1977		29°56' N, 086°07' W	2/1978	United States	25°11' N, 080°12' W	—	United States
36°17' N, 072°27' W	6/1982	United States	29°38' N, 086°13' W	2/1976	United States	25°04' N, 082°50' W	—	United States
36°16' N, 072°26' W	6/1982	United States	29°01' N, 085°20' W	7/2006	United States	24°56' N, 080°22' W	10/1960	United States
35°31' N, 074°46' W	7/2000	United States	28°55' N, 085°10' W	7/2006	United States	24°52' N, 080°34' W	8/1965	United States
34°24' N, 075°14' W	2/1979	United States	28°42' N, 084°28' W	7/2006	United States	24°51' N, 080°37' W	7/1965	United States
34°23' N, 075°13' W	2/1979	United States	28°34' N, 084°29' W	7/2006	United States	24°26' N, 081°48' W	1/1885	United States
34°15' N, 075°06' W	2/1979	United States	28°26' N, 084°27' W	7/2006	United States	24°33' N, 081°24' W	9/1966	United States
33°51' N, 074°36' W	2/1979	United States	28°22' N, 084°24' W	7/2006	United States	24°33' N, 081°24' W	8/1967	United States
33°51' N, 074°35' W	2/1979	United States	28°22' N, 084°20' W	3/2011	United States	22°37' N, 020°03' W	10/1969	Morocco
32°57' N, 077°48' W	3/1960	United States	26°45' N, 079°36' W	2/1979	United States	12°46' N, 070°41' W	9/1963	Venezuela, Bolivarian Republic of
32°26' N, 077°51' W	2/1979	United States	26°44' N, 079°36' W	2/1979	United States			
32°25' N, 077°50' W	2/1979	United States	26°42' N, 079°36' W	2/1979	United States	11°00' N, 019°60' W	2/1968	
32°09' N, 059°59' W	3/1974		26°42' N, 079°35' W	2/1979	United States	04°10' N, 049°43' W	6/1971	Brazil
32°07' N, 064°08' W	8/1971	Bermuda	26°41' N, 079°36' W	2/1979	United States	00°55' N, 029°21' W	7/1981	Brazil
32°01' N, 063°50' W	6/1972	Bermuda	26°36' N, 079°01' W	2/1979	United States	03°51' S, 033°49' W	7/1981	Brazil
31°50' N, 063°52' W	2/1972	Bermuda	26°35' N, 079°29' W	2/1979	Bahamas	15°58' S, 005°04' W	2/1962	Saint Helena, Ascension and Tristan da Cunha
30°08' N, 079°30' W	2/1979	United States	26°25' N, 082°58' W	2/1978	United States			
30°08' N, 079°21' W	2/1979	United States	26°24' N, 083°17' W	3/2011	United States			
30°07' N, 079°20' W	2/1979	United States	25°46' N, 080°11' W	7/1957	United States	24°08' S, 044°43' W	11/1978	Brazil*
30°06' N, 079°54' W	2/1979	United States	25°43' N, 080°01' W	7/1957	United States			